
Ambulation in a Wheelchair-Bound Stroke Survivor Using a Walker with Body Weight Support: A case Study

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Treadmill systems with body weight support (BWS) have been demonstrated to increase overground walking speed, endurance, and balance. However, their use is limited to physical therapy gyms. Training cannot be carried over to home without significant expense. We present the case of a 43-year-old white female with no past medical history who suffered significant neurological impairment as a result of a basilar artery aneurysm. The patient was issued a walker system with BWS that allowed her to function significantly better than before she received the walker system. Implications of using the walker system with BWS in the inpatient, outpatient, and home settings are discussed. **Key words:** *body weight, cerebrovascular diseases, cerebrovascular accident, gait, self-help devices, walkers*

Animal and human studies have demonstrated that specific types of intensive training strategies used to retrain patients to walk after they suffer neurological impairment can significantly influence the degree of motor recovery.¹⁻³ Studies in adult spinal cats have demonstrated near-normal recovery of walking patterns after the cats have undergone a period of interactive training during which weight support for the hindquarters is provided.⁴⁻⁶ Researchers have suggested that body weight support (BWS) on a treadmill during gait training may be efficacious and effective,⁷⁻¹¹ but a meta-analysis of these studies concludes that there is “not enough evidence from trials to determine the effect of treadmill training with body weight support for walking after stroke.”¹² BWS systems consist of overhead suspension systems and harnesses that support a portion of the patient’s body weight. As the patient retrains in ambulation on a treadmill, the amount of BWS progressively decreases as gait improves. BWS facilitates walking in patients with neurological impairments who typically require significant assistance to bear full weight on their lower limbs.

There are several reasons why BWS may help to facilitate recovery of ambulation after a stroke. First, gait training can be initiated earlier, because

BWS compensates for some of the skills that are lost when neurological impairment occurs. Second, BWS provides a dynamic and task-specific approach that integrates three essential components of gait: weight bearing, stepping, and balance. Third, the treadmill stimulates intensive training that requires repetition and rhythm while the patient is supported in an upright position. Fourth, practicing gait itself is a better means to recover walking abilities than an approach that emphasizes movement and control of isolated lower limb muscles.^{13,14} Finally, BWS allows symmetrical training of the lower limbs that discourages the development of compensatory strategies that result in asymmetrical gait patterns.^{10,14}

Preliminary studies suggest that the use of gait training with BWS leads to a better recovery of ambulation, with effects on overground walking speed, endurance, and physical assistance required to walk.¹⁵⁻¹⁷ Chronic, nonambulatory pa-

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Top Stroke Rehabil 2005;12(4):50-55
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tients with stroke and spinal cord injuries have been reported to regain the ability to walk after a course of gait training with BWS.¹⁵⁻¹⁷ A randomized clinical trial of patients with incomplete spinal cord injury that compares 12 weeks of treadmill training with BWS combined with conventional physical therapy and conventional physical therapy alone still is in progress.¹⁸ Patients with stroke were also reported to have recovered better walking abilities with this approach than with traditional Bobath approaches¹⁹ that focus on pre-gait weight-bearing and weight-shifting activities.⁶

However, BWS with treadmill training only can be used in a therapy setting. It cannot be used in more realistic settings, such as overground walking and home settings. As a result, patients cannot carry over learned skills into the home environment. They cannot use the actual apparatus as a means to ambulate more safely in the rehabilitation facility or home. A device named the Up N Go[®] (Easy Walking, Inc., Maple Glen, PA) was constructed to allow patients to begin ambulation training earlier in the rehabilitation process and to use the device functionally to progress to a supervision level more quickly, which would allow potentially earlier discharges to home from the inpatient rehabilitation facility (IRF). The Up N Go[®] may decrease the incidence of falls and improve balance and gait quality.

The Up N Go[®] is considered a class I (special control) device by definition of the US Food and Drug Administration (FDA) and does not require an investigational device exemption (IDE). It is similar to devices such as the Merry Walker[®] Ambulation Device (Merry Walker Corp., Richmond, IL), with the addition of a pelvic support and a hydraulic system to provide BWS. It consists of a walker with two projections extending from the superior aspect of the walker (**Figure 1**). The projections attach to a support harness. The suspension mechanism is regulated by two pistons that control the amount of weight support given to the patient.

Case Report

The patient is a 43-year-old right-handed white female, with no past medical history, who suffered a nontraumatic brain injury due to a basilar artery



Figure 1. Up N Go[®] walker with partial body weight support.

aneurysm rupture in 1999. She was admitted to a tertiary-care academic medical center, during which time she was medically stabilized and subsequently transferred to a local inpatient acute rehabilitation facility. Her residual deficits included ataxia, truncal weakness, right facial droop, dysarthria, dysphonia, dysphagia requiring gastrostomy feedings, and lower extremity weakness. She underwent gait analysis following her inpatient rehabilitation stay. During that time, she was found to have truncal and limb ataxia that interfered with balance during ambulation. She could not use the solid molded ankle-foot orthoses that she had acquired, because they interfered with her gait. Despite the recommendation for articulated ankle-foot orthoses allowing 5 degrees of plantar flexion and a rolling walker, the patient largely could not ambulate without assistance. She underwent extraocular muscle surgery to reposition the muscles to allow her to see more clearly.



Figure 2. Patient in wheelchair before use of Up N Go®.

The patient was readmitted to the tertiary-care academic medical center in the fall of 2002 for pneumonia, a urinary tract infection, and aspiration pneumonia that resulted in dehydration. The patient again was medically stabilized and transferred to the rehabilitation unit within the hospital once the acute medical treatment was completed. During the rehabilitation stay, the patient improved functionally in mobility and activities of daily living. However, due to her persistent ataxia, she could ambulate only with contact guard using hand-held assistance. She largely depended upon her wheelchair for mobility within the home (**Figure 2**).

Once home, the patient continued to participate



Figure 3. Patient performing standing task using Up N Go®.

in a home physical therapy program. The home physical therapist reported that the patient was seen for hour sessions three times per week. With a standard walker, it was impossible for the patient to relearn normal weight shifting, posture, and pelvis girdle rotation during gait. The patient's righting reactions did not appear to be present using a standard walker.

During this time, the patient obtained the Up N Go® walker system with BWS. The home physical therapist reported that the patient used the Up N Go® approximately 50 minutes during each session. In addition, the patient used the Up N Go® system approximately 5 to 10 hours with her

Table 1. Function before and after the use of the Up N Go®

Function	Before Up N Go®	After Up N Go®
Wheelchair transfers	Close supervision to contact guard with decreased safety and increased time to complete task by 4–5 times normal	Independent to distant supervision with increased safety, decreased ataxia, and time to complete task reduced to 2 times normal
Sit to stand from wheelchair	Moderate assistance of one with contact guard assistance for 20–30 seconds once standing to allow patient to find balance	Minimal assistance of one with patient able to find balance once standing without assistance
Sit to stand at kitchen sink	Minimal to moderate assistance	Close supervision
Tall kneeling	Static balance with control of pelvic and shoulder girdle 10–15 seconds independent before losing balance	Static balance with pelvic and shoulder girdle control independent 1–2 minutes before fatigue
Quadriped	Minimal-to-moderate assistance to stabilize pelvic girdle, crawling 10 feet with frequent loss of balance, increased time to complete task 15 or more minutes, with exhaustion following	Close supervision with verbal cues, 30 feet with patient able to turn 180 degrees to change direction, increased time to complete task less than 15 minutes
Ambulation	Using a standard or rollator walker, bilateral articulated molded ankle-foot orthoses 60 feet in 12 minutes on linoleum, carpeting with contact guard. Loss of balance requires minimal-to-moderate assistance. Mild kyphosis, forward flexed head noted during gait.	Using partial weight support walker system, no molded ankle-foot orthoses, over 400 feet, requiring 3 to 4 minutes to complete 60 feet. No kyphosis, forward flexed head noted. Ataxia of upper trunk significantly decreased.
Floor-to-couch transfer	Maximum assistance with patient motivated to struggle more than 15 minutes	Close supervision without a struggle with completion in less than 1 minute

husband's supervision and in conjunction with an occupational therapy regime of activities of daily living and upper extremity strengthening.

Using the Up N Go®, the patient significantly improved in various aspects of function (**Table 1**). These improvements required only 1 month. At the end of this period, the patient could perform household (**Figure 3**) and outdoor (**Figure 4**) activities using the Up N Go® from a standing level.

Discussion

The Up N Go® provides a safe environment for patients to ambulate while establishing a normal gait pattern. The harness allows the patient to “fall” without hurting themselves. Because the Up N Go® increases control of the upper trunk, the patient is able to practice ambulation without

holding onto a standard walker. Thus, the patient gains a greater sense of dynamic balance resulting in more confidence when attempting high-level balance activities. Patients can use mental imagery to picture themselves walking “normally,” while therapists are freed up to walk around the patient and assist in particular problematic aspects of gait. The patient also can practice backward and sideward gait, sit to stand transfers, and dynamic standing balance activities, while focusing on normalizing the position of the center of gravity during gait. The result of such practice is longer training sessions using “forced ambulation” at more rapid rates, better endurance and velocity, and a more effective cardiac and aerobic effect.

The major limiting factor of the Up N Go® is that it cannot be set up to provide consistent parameters for exercise, such as walking velocity. This



Figure 4. Patient performing outdoor activity

may limit the patient from being able to begin exercise at a basic level and building up velocity and distance, thereby improving cardiovascular benefits. However, the biggest advantage to the Up N Go[®] is that it is not limited to use in a physical therapy gym. It can be used in any single-level living environment, such as home, assisted living facilities, and extended care facilities. This allows the Up N Go[®] to be used in functional activities rather than mere training exercises. The ability to transfer the Up N Go[®] into the home environment allows patients to move more freely and allows more independence in activities of daily living.

In summary, this case report demonstrates how a new device can assist a patient in becoming more functional at home, thus releasing her from the confines of a wheelchair. The Up N Go[®] may not be useful in all patients; patients should be able to use their lower extremities if this walker system is to be utilized. Future case reports need to be described in other environments, such as assisted living, extended care facilities, or in IRFs. Randomized clinical trials should be performed to determine whether the Up N Go[®] saves time and therapist help in acute rehabilitation facilities. If the efficacy of systems such as the Up N Go[®] can be demonstrated, it will add an extremely useful mobility aid that not only allows patients to be mobilized sooner after admission for disabling conditions, but will be able to be carried over at home if necessary.

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